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Winnecke	1877	Jan. 6	Gut II Klasse, 1½′ gross mit ... 1. Mit 170 facher Vergr. 30″ l., 20″ br., verlängert in $p = 7^\circ{\cdot}2$.
Winnecke	1877	Jan. 10	Ein recht heller Nebel, II Klasse, 30″ l., 20″ br., zur Mitte stark, fast fixsternartig verdichtet.
Winnecke	1877	Sept. 14	Obgleich der Himmel sich wieder ziemlich stark mit Cirrus bezogen hat, sehr gut sichtbar, 1′ lang, gedehnt in $p = 20^\circ$; scheint einen fixsternartigen Kern = $12^m{\cdot}13$ zu haben.

The descriptions of the Nebula by the Herschels agree entirely; nor has Lord Rosse noticed anything particular. But in December 1861 the Nebula, which had been observed five years before by D'Arrest with a much smaller refractor, was *invisible* to Schönfeld with the splendid Mannheim refractor. In the years 1863 and 1864 it is observed both by Schönfeld and D'Arrest; 1865, November 13 and November 20, it is *again invisible* to the sharp eyes of Dr. Vogel with the Leipzig refractor. It may be noticed that an error in pointing the telescope on these days is impossible, for Dr. Vogel has observed other nebulæ near it on November 13 and 20. Schönfeld observed the Nebula again in the year 1868 without difficulty, and in the present year it is a *very easy* object for 6½-inch aperture.

It seems, therefore, probable that the quantity of light from this object reaching our eyes is very different in different years; a most important conclusion, as it is the first instance of a very great evidence for *periodic* variability of a Nebula.

Strasburg, 1877, *Dec.* 11.

On a Cause for the Appearance of Bright Lines in the Spectra of Irresolvable Star Clusters. By E. J. Stone, M.A. Camb., Her Majesty's Astronomer, Cape of Good Hope.

In the Supplementary Number of the *Notices*, vol. xxxvii., there appears a short paper by Mr. Proctor "On the Arc of Light seen round *Venus* in transit." To this paper are appended some remarks which are, I presume, intended to be a criticism of my paper which appeared in the *Proceedings of the Royal Society*, No. 180, 1877. It appears to me, however, that Mr. Proctor has missed the point of my paper; and as I should prefer that my meaning be understood, I shall give Mr. Proctor's remarks and a statement of my views, extracted from the *Proceedings of the Royal Society*, for comparison with each other.

But before proceeding to this point I may perhaps be allowed to mention that Mr. Proctor's paper "On the Arc of Light seen round *Venus* in transit" is a particular case of the problem investigated by Sir G. B. Airy in the *Monthly Notices*, No. 1, vol. xxiv., 1863. Sir G. B. Airy proves that, if a part of the Sun's disk is viewed through a refracting medium which produces

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an effect analogous to that of a convex lens, that part of the disk will not be of greater apparent brightness than the rest; or, "that no refraction can cause a change in the apparent brightness of the surface visible." As Prof. Airy's investigation is very complete and covers the ground of Mr. Proctor's paper, I presume that Mr. Proctor must have been unacquainted with the investigation at the time his paper was written.

The following are Mr. Proctor's remarks upon my paper:—

"It is asserted that an irresolvable stellar nebula would diminish in apparent brightness (so far as the stellar part of its light is concerned) with increase of distance. No reasoning is given in support of this assertion, and I can see no reason for withdrawing the reasoning by which, in a paper 'On the Resolvability of Nebulæ regarded as a test of distance,' I show (incidentally) that a nebula, so long as it remained irresolvable, would be of constant intrinsic brightness whatever its distance."

My statement of my views is as follows:—

"The Sun is known to be surrounded by a gaseous envelope of very considerable extent. Similar envelopes must surround the stars generally. Conceive a close stellar cluster. Each star, if isolated, would be surrounded by its own gaseous envelope. These gaseous envelopes might, in the case of a cluster, form over the whole or a part of the cluster a continuous mass of gas. So long as such a cluster was within a certain distance from us, the light from the stellar masses would predominate over that of the gaseous envelopes. The spectrum would therefore be an ordinary stellar spectrum. Suppose such a cluster to be removed farther and farther from us. The light from each star would be diminished in the proportion of the inverse square of the distance; but such would not be the case with the light from the enveloping surface formed by the gaseous envelopes. The light from this envelope received on a slit in the focus of an object-glass would be sensibly constant, because the contributing area would be increased in the same proportion that the light from each part is diminished. The result would be, that at some definite distance, and all greater distances, the preponderating light received from such a cluster would be derived from the gaseous envelopes, and not from the isolated stellar masses. The spectrum of the cluster would therefore become a linear one, like that from the gaseous surroundings of our own Sun. The linear spectrum might, of course, under certain circumstances, be seen mixed up with a feeble continuous spectrum from the light of the stars themselves.

"It should be noticed that, in this view of the subject, the linear spectrum can only generally appear when the resolvability of the cluster is at least injuriously affected by the light of the gaseous envelopes becoming sensibly proportional to that from the stellar masses, and that in the great majority of such cases it would only be in the light from the irresolvable portions of the cluster that bright lines could be seen in the spectrum."

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When the paper was read, it appears that Professor Stokes objected that, although the contributing area of the gas would be increased in the way indicated, yet other stellar masses would at the same time be crowded into the line of sight, and that it need not therefore follow that the spectrum should become linear with increase of distance.

So long as the gaseous envelopes are considered to be isolated round each individual star, and to be of comparatively speaking small dimensions, the objection is a valid one; but the clusters which I had under contemplation were physical clusters, and this isolation of the gaseous surroundings would be, under suitable conditions, destroyed by the relative gravitation and heating effects of the several members of the system. It is to such a cluster only that my reasoning applies; and I think such will be seen to be the case if my paper is carefully read.

I need hardly say that, after I heard of Professor Stokes' objections, I carefully reconsidered the theory; but after the best consideration I can give the subject, I believe my conclusion is sound, and there the matter must rest for the present so far as I am concerned.

With respect to Mr. Proctor's own views: If he thinks that he has proved that, because a stellar cluster is irresolvable with a telescope of small aperture and small power, it must follow that "it would be of constant intrinsic brightness at all greater distances," I think there would be no great difficulty in proving that he is mistaken. I have introduced the words "small aperture" and "small power" as presenting the case in an exaggerated form, and merely to indicate the point upon which I think his theory fails.

I must also, as bearing on the same point, call attention to a very general statement of Mr. Proctor's, that "he has shown that by no optical contrivance can apparent brightness be increased, though quantity of light can of course be greatly increased." This statement certainly requires qualification; for, if it were true, why could not the satellites of *Mars* be as easily seen with a 4-inch as with the 26-inch of the Washington Observatory? I know, of course, what Mr. Proctor should, and probably does, mean; and I should not have called attention to this point had it not been the fact that the principal cases of exception are those which have been under consideration in the present paper.

Note on Specular Reflexion from Venus.

By W. H. M. Christie, Esq.

In the *Monthly Notices* for December 1876, I gave some observations on the gradation of light on the disk of *Venus*, made with the object of testing Mr. Brett's hypothesis of specular reflexion